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Short Communication

Pulse rate and Spo_2 in different phases of menstrual cycle in healthy women of Kerala

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ABSTRACT

Background and Objectives: The studies on relationship between different phases of menstrual cycle and pulse rate and Spo_2 changes in healthy women of Kerala are inadequate. So, this preliminary study was plan to report the same.

Material and Methods: The present study was performed in twenty healthy women of Kerala, age ranging from 20-40 (mean age 27+/- 61054). Spo_2 and pulse rate were recorded with pulse - oximeter in different phases of menstrual cycle and analysis of data was done by spss 20.0.

Results: Variations of pulse rate and Spo_2 in different phases of menstrual cycle are not statistically significant at $p > 0.05$.

Conclusion: it was observed that there was slight increase in pulse rate in ovulatory phase and slight increase in $Sp0_2$ in secretory phase, though it is not statistically significant. It may be due to small sample size. Hence this study certainly merits continuing the work with more investigations in the field.

Keywords: $Sp0_{2'}$, Menstruation, Menstrual cycle, secretary phase, menstrual phase

Introduction:

The menstrual cycle, characterized by sex hormone fluctuations, is a basic physiological factor that continuously affects body function in premenopausal women. Menstrual cycle (MC) is recurrent monthly discharge of blood from female genital canal. Menstrual is a latin word which means 'Mensis', a month i.e. a lunar month of 28 days. The length of the cycle is notoriously variable in women, but an average figure is 28 days from the start of one menstrual period to the next. The menstrual cycle (MC) has a cyclical nature that has been identified as a major factor in changes in

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female physiology [1]. The human menstrual cycle occurs in '4' phases: menstrual, proliferative, ovulatory and secretory phases. Physiological and/ or hormonal effects of menstrual cycle on the autonomic function have been extensively examined [2, 3]. Changes in hormone concentrations secreted by the hypothalamus-pituitary-gonadal axis, particularly estrogen and progesterone, determine the phases of the MC [4]. Autonomic nerve function status may be changed during follicular and late luteal phases of menstrual cycle due to fluctuations of serum estrogen and progesterone levels. This alteration in autonomic nerve functions may affect cardiovagal control and usually associated with decreased parasympathetic activity in late luteal phase [5]. It was demonstrated that significant differences in autonomic nervous system activity in leuteal phase compared to the other phases of menstrual cycle [6]. In previous studies, it was found that in healthy women, plasma norepinephrine levels and sympathetic activity were significantly higher in the luteal phase than in the follicular phase [7, 8, 9]. Measurement of pulse rate is a non invasive method to assess sympathetic and parasympathetic activity on the heart. Oxygen saturation (Spo_2) is defined as the ratio of oxy-hemoglobin to the total concentration of hemoglobin present in the blood (ie Oxy-hemoglobin + reduced hemoglobin). It was reported that po_2 was higher in luteal phase than proliferative phase [10].

Female health care is very important to give birth to the healthy population and also for their efficient work. To the best of our knowledge studies on relationship between different phases of menstrual cycle and Pulse rate and Spo2 changes in healthy women of Kerala are inadequate. Therefore, the present study was undertaken to create awareness among the healthy women to improve the quality of life and also the physicians to take appropriate measure for prevention of complications.

Materials and Methods:

The present study has been performed at Little Flower Medical Research Centre, Angamaly during the period of february to march. A total of twenty healthy women age range from 20 to 40 (mean age 27+/- 61054) were enrolled. All participants reported they were knowledgeable about their MC, which occurred regularly between 25 and 40 days. All evaluations were done in the morning. The purpose and procedure of the study were explained to each subject. Written informed consent was taken from all the participants. Study protocol was approved by Institutional Ethics Committee of Little Flower Medical Research Centre, Angamaly.

Pulse oximetry is a non-invasive method allowing the monitoring of the saturation of hemoglobin and pulse rate. The oximeter uses oximetry to measure functional oxygen saturation in blood. Pulse oximeter works by applying the sensor to a pulsating arteriolar vascular bed, such as a finger or toe. The sensor contains dual light source and a photonic detector. Bone, tissue, pigmentation, and venous vessels normally absorb a constant amount of light over time. The arteriolar bed normally pulsates and absorbs variable amounts of light during the pulsations. The ratio of light absorbed is translated into a measurement of functional oxygen saturation (SpO2). Pulse oximetry is based on two principles:

- Oxyhaemoglobin and deoxyhaemoglobin differ in their absorption of red and infrared light.

- The volume of arterial blood in tissue (hence light absorption by the blood) changes during the pulse.

The oximeter determines SpO2 by passing red and infrared light into an arteriolar bed and measuring changes in light absorption during pulsatile cycle.Red and infrared low – voltage light emitting diodes (LED) serves as light sources; a photonic diode serves as the photodetector.Because oxyhaemoglobin and deoxyhaemoglobin differ in light absorption, the amount of red and infrared light absorbed by blood is related to hemoglobin oxygen saturation.

To identify the oxygen saturation of arterial hemoglobin, the oximeter uses the pulsatile nature of arterial flow. During systole, a new pulse of arterial blood enters the vascular bed, and blood volume and light absorption increase. During diastole, blood volume and light absorption reach their lowest point. The oximeter bases its SpO2 measurements on the difference between maximum and minimum absorption (measurements at systole and diastole). By doing so, it focuses on light absorption b y pulsatile arterial blood, eliminating the effects of non – pulsatile absorption by tissue, bone and venous blood.

Procedure

Our aim was to observe pulse rate and Spo_2 during different phases of menstrual cycle. Each subject individually visited the laboratory of Little Flower Medical Research Centre before the experiment and detailed instructions were given on experimental protocol. After signing the voluntary informed consent, all the subjects were provided with the knowledge about different phases of menstrual cycle and requested to maintain a note of the cycle. The subjects were asked to visit the laboratory during each phase of the menstrual cycle and pulse rate and Spo_2 are recorded by using pulse oximeter. Basal body temperature is measured to confirm the ovulatory phase.

Data analysis

The analysis of data is done by SPSS 20.0.

Results

The analysis of data is presented in Table 1. Variation of pulse rate in different phases of menstrual cycle is not statistically significant as P value is 0.752 ($P > 0.05$). However mean pulse rate is higher in ovulatory phase (88.60±12.36) and lower in secretory phase (84.55±11.00) (Fig: 1). Variation of Spo_2 is not statistically significant as p value is 0.580. Mean Spo_2 is equal in menstrual and proliferative phases (0.99±0.00725) and slightly increased in ovulatory phase (0.9910±.01714) and secretory phase (0.9940±.00598) (Fig: 2). Co-efficient of variance is less for the $Sp0_2$ than pulse rate. So Spo_2 is better measure than PR.

Table: 1 Changes in Pulse rate and Spo_2 in different phases of menstrual cycle

Variables	PR	SP02
Menstrual	87.45±12.51	0.99±0.0072
Proliferative	87.95±14.38	0.99±0.0072
Ovulatory	88.60±12.36	0.99±.01714
Secretory	84.55±11.00	0. 99±0.0059
P value	0.752	0.580

PR, Pulse rate;

Figure-1: Mean Pulse rate in different phases of menstrual phases

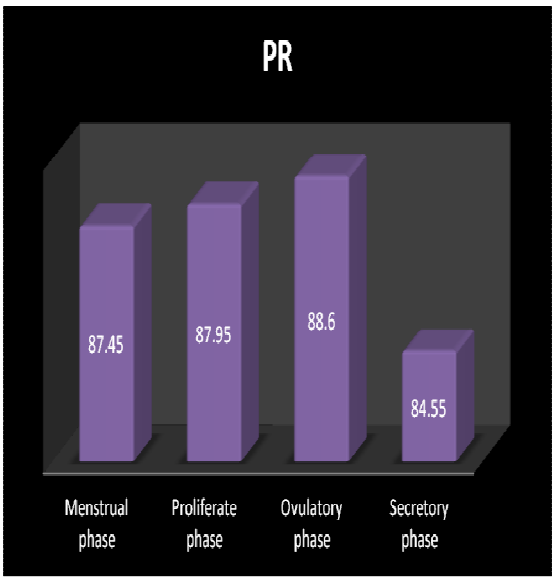
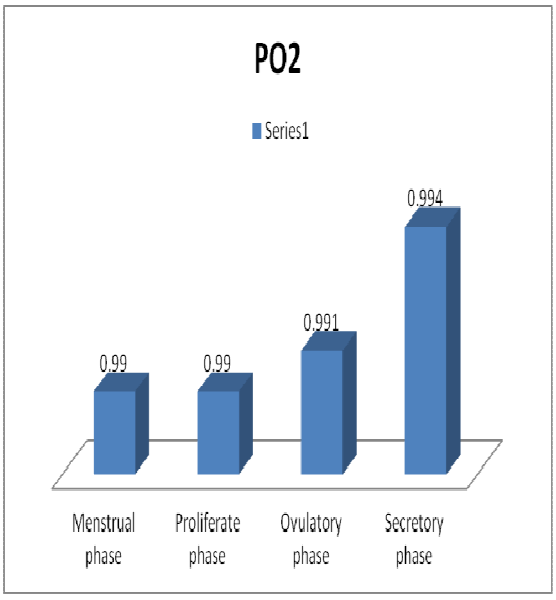


Figure-2 Mean Spo_2 in different phases of menstrual cycle



Discussion

The menstrual cycle in human females is a monthly cycle that begins with menstruation (shedding of the endometrium or uterine lining) and ends with either pregnancy or the beginning of a new cycle. It is significantly associated with number of corresponding changes in neurohumoral homeostatic mechanisms regulating the cardiovascular system [11]. Different phases of the menstrual cycle in apparently healthy females are associated with variations in heart rate, mean arterial pressure, plasma volume, vascular tone, postural vasoconstriction and plasma nor-adrenaline levels. However, information on the pulse rate and Spo_2 during various phases of the menstrual cycle in human females is scanty and not consistent [12-16]. Several studies have found variations in sympatho vagal activities during menstrual cycle but their results are not consistent others explained this variation by alteration in the balance of ovarian hormones [17-19].

Sneha et al reported that autonomic regulation of the heart in the normal woman differs during the menstrual cycle [20]. Nozomi et al clarified in their study that for normally cycling women, sympathetic nervous activities are more predominant in the luteal phase. Kigawa J reported that pO_2 was higher and pCO_2 was lower in the luteal phase than proliferative in 7 menstrual cycles [21]. But this doesn't agree with our study where we haven't observed significant changes either in pulse rate or in Spo_2.

We observed slight increase in pulse rate values in ovulatory phase and slight increase in Spo_2 in secretory phase; however it is not statistically significant. It may be due to small sample size can be the cause of insignificant differences. Hence this study certainly merits to continue the work with more investigations in the field.

Conclusion

We compared Spo_2 levels and pulse rate in different phases of menstrual cycle in 20 healthy women of Kerala. We have not observed any significant changes either in

Spo_2 or in pulse rate during different phases of menstrual cycle.

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