Original Research Paper

Volume-9 | Issue-7 | July - 2019 | PRINT ISSN No. 2249 - 555X

Physiology

EFFECT OF DIFFERENT PHASES OF MENSTRUAL CYCLE ON PULMONARY FUNCTION TESTS IN HEALTHY YOUNG FEMALES.

Chhaya Batham — Assistant Professor, Department of Physiology, Gandhi Medical College, Bhopal, Madhya Pradesh.

Bhavna Gupta* — Assistant Professor, Department of Physiology, LNMC & RC, Bhopal. Madhya Pradesh. *Corresponding Author

ABSTRACT Alteration in the levels of female sex hormones during the menstrual cycle are known to affect the smooth muscles of respiratory tract.

AIM AND OBJECTIVE: Main objective of the study is to find out the effects of different phases of menstruation on pulmonary function parameters in different phases of menstrual cycle

MATERIAL AND METHOD: In the present cross sectional descriptive study conducted in female nursing students aging 18 to 22 years were considered. . The study was undertaken to assess pulmonary function parameters in different phases of menstrual cycle

RESULTS: Longest FVC, FEV_1 and PEFR were found to be in secreatory phase in comparison to proliferative and menstrual phase. Shortest FVC, FEV_1 and PEFR were found in secretary phase.

KEYWORDS : Forced vital capacity, Forced expiratory volume in 1 second, Peak expiratory flow rate, pulmonary function test.

INTRODUCTION:

Menstruation is a physiological phenomenon which occurs in women during her reproductive years. Menstrual cycle occurs in three phases: menstrual, follicular and luteal which are regulated by sex hormones, estrogen and progesterone from ovaries and also by gonadotropins: luteinizing and follicle stimulating hormones from anterior pituitary.[1] During this menstrual cycle the hemostasis (i.e. the cessation of bleeding) is achieved through a delicate equilibrium between the coagulation and the fibrinolytic cascades. The formation of a stable fibrin clot is preceded and regulated by sequential activation of coagulation factors in events called the coagulation cascade. Activation of blood coagulation is associated with accelerated clot formation, whereas activation of blood fibrinolysis enhances the breakdown of the blood clot. Intact hemostatic potential is essential for the control of menstrual bleeding.[2]

Changes in the levels of female sex hormones during menstrual cycle are known to affect the Physiological changes as well as psychological changes multiple scientific effort have described the effects of menstrual cycle on various issues related to related to respiratory health like exacerbations of bronchial asthma(2-4) hospital admissions(5-6) ,bronchial hyper reactivity bronchial hyper reactivity (BHR) [7].

A significant increase in ventilation in the luteal phase as compared to other phases of menstrual cycle was observed in earlier studies [8-12]. They suggest progesterone is a cause of increased ventilatory capacity during luteal phase, as progesterone has its effect on airway smooth muscle (ASM) relaxation. However, there are many studies which contradict the data highlighting the changes in respiratory parameters during different phases of menstruation. Also, there were none of the studies available till date about the effect of menstrual cycle on respiratory efficiency. Therefore the current study was done to evaluate the effects of menstrual cycle on various parameters of the lung functions and respiratory efficiency.) coagulation cascade by producing parallel changes in the prothrombotic tendency and the fibrinolytic activity of healthy women.[3] It appears that platelet function is increased during the luteal phase. There is also variation in the number of platelets and platelet retention during various phases of menstrual cycle.[4,5]

Female sex hormones mainly estrogens and progesterone, have some possible influence over the clotting and fibrinolytic activity of the blood, and on smooth muscles of respiratory tract. This research on will help the female candidates in the treatment of various system ailments and the monthly cyclical patterns of some symptoms and also in preparation of competitive sports and other such activities. Therefore,main objectives of the study are to find out the effects of different phases of menstruation on Pulmonary function tests.

MATERIAL AND METHOD:

This was a cross sectional descriptive study conducted in female nursing students from LN Nursing college, Bhopal.

Data collection and analysis was done in April 2016 to October 2017 (18 months). Protocol was submitted to Institutional ethical committee and ethical approval was sought. During data collecting a study objectives and methods were explained to all participants using 'participant information sheet', that covered all the information of current study. Thereafter informed written consent was obtained from all each participants.

Inclusion criteria were normal healthy female aged 18 to 22 years with regular menstrual cycle (30 days ± 3 days) in previous six cycles and exclusion criteria were female with irregular menstrual cycles, subjects on oral contraceptives, anemic females, cases of any serious illness.

Sample size was decided to be140 female nursing students from LN Nursing college, Bhopal.

Pretested semi structured questionnaire was used. Questions were regarding history of irregular menstrual cycle, whether the subjects taking oral contraceptives, history of chronic respiratory illness. other information obtained was present complaints, past history of any disease of surgery, menstrual history, history of history of drug use, family history.

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Pulmonary function test was performed to record parameters like forced expiratory volume at the end of 1 sec (FEV_1), forced vital capacity (FVC) and peak expiratory flow rate (PEFR) using ERS guidelines.

Data collection was done in following way. pulmonary function parameters in different phases of menstrual cycle. Menstrual cycle was charted for 6 months for confirming regularity. From the date of onset of menstrual cycle, probable date of ovulation was calculated, based upon which, different phases of menstrual cycle was determined. Subjects were asked to come on the 3rd, 13th and 21st days of menstrual cycle in the morning hours between 8.30 am to 9:00 am. If the calculated day fell on a holiday, then the subsequent cycle was taken.

Detailed clinical examination was done including height and weight, chest diameters, and detailed clinical examination of respiratory system. Materials used for study includes weighing scale, measuring tape, computerized spirometer (RMS HELIOS 401)

Data was entered and analysis using Microsoft office Excel 2007 and

Graph pad prism 5.

RESULT:

140 subjects completed a study. Reasons for exclusion were lost to follow up or consent was not given.

Table 1: pulmonary function test results in different phases of menstrual cycle in seconds

Parameter: Mean (SD)	Proliferative phase	Secreatory phase	Menstrual Phase	F statistic	ANOVA p-value
FVC	2.05 (0.38)	2.26 (0.38)	2.02 (0.33)	13.2342	<0.001
FEV1	1.99 and 97% (0.37)	2.17 and 96% (0.33)	1.96 and 95% (0.39)	10.39	<0.001
PEFR	4.00 (1.03)	4.46 (0.83)	3.91 (1.11)	9.0657	<0.001

Table 2: Post hoc test (Tukey HSD) results for pulmonary functions test results in different phases of menstrual cycle:

Different phases of menstrual cycle	Tukey HSD Q statistic			Tukey HSD p-value Significant results as *		
	FVC	FEV1	PEFR	FVC	FEV1	PEFR
Proliferative vs Secreatory	5.8265	5.0474	4.6713	0.001*	0.001*	0.003
Proliferative vs Menstrual	0.8605	0.9517	0.9555	0.796	0.759	0.757
Secreatory vs Menstrual	6.6870	5.9991	5.6268	0.001*	0.001*	0.001

In our study we found longest FVC, FEV1 and PEFR in secreatory phase in comparison to proliferative and menstrual phase. Shortest FVC, FEV1 and PEFR was found in secretary phase. The p-value corresponding to the F-statistic of one-way ANOVA is lower than 0.05 in all 3 parameters [Table 1], suggesting that the one or more groups are significantly different. The Tukey HSD (Honestly Significant Difference) test post-hoc test shows that all the pairs of groups are significantly different from each other except Proliferative vs Menstrual group where results for all 3 parameters are non-significant [Table: 2]

DISCUSSION:

Sex hormones play an important role in women's health. There are physiological variations in endogenous hormones during menstrual phase. Furthermore, use of exogenous hormones like oral contraceptives, hormone replacement therapy also plays a role in this variation.[6]

Physiological changes which occur during the course of menstrual cycle are mostly due to complex interactions essentially involving the hypothalamo-hypophyseal ovarian axis and the uterus. Almost all the changes are phase related and dependent on sensitive regulatory mechanisms. Variation in the functional parameters of many systems may be related to fluctuation in the hormone levels during the different phases of menstrual cycle.

In our present study, we found highest FVC in secreatory phase in comparison to proliferative and menstrual phase. Lowest FVC was found in menstrual phase. We found significant difference in FVC between proliferative and secreatory and secreatory and menstrual phases.

In a study conducted by Pai RS in 2004, it was found that FEV_1 and FVC significantly increased ($P<0.01$) in the luteal phase when compared to the menstrual phase.[7]

Similar results were observed in a study conducted by Rajesh CS, in Delhi in 2000.[8]

In a study, conducted by PKS Dimple, in 2015, it was found that the mean values of FVC in both Group I and GroupII were the highest in secreatory phase followed by follicular phase and the lowest in menstrual phase.[9]

In our study, we found significant difference in FVC between proliferative and secreatory and secreatory and menstrual phases. This is comparable to observations made by Pai RS[4][7], Rajesh CS[8], Rao GS[10], Das TK[11].

In our present study, we found highest FEV_1 in secreatory phase in comparison to proliferative and menstrual phase. Lowest FEV_1 was found in menstrual phase. We found significant difference in FEV_1 between proliferative and secreatory and secreatory and menstrual phases. Studies by Mannan SR[12]and Polly ZA[13]showed the similar result.

In our present study, we found highest PEFR in secreatory phase in comparison to proliferative and menstrual phase. Lowest PEFR was found in menstrual phase. We found significant difference in FVC between proliferative and secreatory and secreatory and menstrual phases.

A study conducted by Nandani et al demonstrates the variations in pulmonary functions during different phases of menstrual cycle in regularly menstruating adolescent girls. They concluded that lung volumes and peak expiratory flow rates were better during the luteal phase of menstrual cycle and lowest during the menstrual phase.[14]

In our present study, we found significant difference in FVC between proliferative and secreatory and secreatory and menstrual phases. This is comparable to observations made by Rajesh CS.[8]

Hence we conclude that pulmonary function test was significantly improved in secretary phase this change could be attributed to the bronchodilator effect of progesterone. We also suggest clinicians treating young females suffering from respiratory illness should give attention to menstrual phases while prescribing bronchodilator drug and should well differentiate between conditions like premenstrual asthma. Further studies are required to observe effects of these sex hormones at molecular level in lung parenchyma.

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