EFFECT OF FOLLICULAR AND LUTEAL PHASE OF MENSTRUAL CYCLE ON VISUAL REACTION TIME IN HEALTHY ADULT FEMALES

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Background & Objectives: During menstrual cycle the level of female sex hormones changes. These not only affect the female reproductive organs but also affect central nervous system. The aim of this study is to evaluate the effect of follicular and luteal phase of menstrual cycle on reaction time. **Method:** The study was conducted on 50 healthy adult female with regular menstrual cycle, between the age group of 26-40 years. Simple and Choice visual reaction time were measured during follicular and luteal phases**.** The result was statistically analysed by graph Pad Instat Statistical software (demo version). P<0.05 was taken as significant. **Results**: Simple and Choice visual reaction time both were longer during luteal phase as compared to follicular phase of menstrual cycle. **Interpretation & Conclusion**: Prolonged visual reaction time during luteal phase could be due to effect of progesterone on neural transmission.

Key Words: Visual reaction time, Follicular phase, luteal phase, menstrual cycle.

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Introduction:

The normal reproductive years of a female are characterized by regular rhythmical changes in the rates of secretion of the female hormones and the resultant changes in the ovaries and other sexual organs. This rhythmical pattern is called the female monthly sexual cycle or menstrual cycle[1].

sensorimotor performance or a combination of both[2]. Sex hormones are known to affect a whole gamut of CNS modalities such as neurite outgrowth, synaptogenesis, dendritic branching, myelination which ultimately affects the neural plasticity .It can be postulated that the sensory motor performances could be modulated/altered during the different phases of menstrual cycle[2].

Reaction time has been defined as the time interval between the application of the stimulus and an appropriate voluntary response by the subject[3] .It provide an indirect index of processing capability of CNS and a simple means of determining ones sensory-motor performance[4] . A significant reduction in the response time indicates an improved sensorimotor performance and/or enhanced processing ability of the CNS, whereas a prolonged response time indicates a deterioration of processing capability of the CNS or poor

Reaction time is used to measure the ability in processing information and in judging the ability to concentrate and coordinate[5].

Present study was carried out to study and evaluate the effect of different phases of menstrual cycle on visual reaction time.

Material and Methods:

The study was carried out in Department of Physiology, Government Medical College, Bhavnagar. Total 50 subjects were selected between the age group of 26-40 years. Subjects were selected on the basis of inclusion and exclusion criteria. Written consent was taken from them. The study was approved by Institutional Review Board of Government Medical College, Bhavnagar.

Subjects between the age group of 26-40 years having regular menstrual cycle of 27-35 days for at least past 6 months were included in this study. Subjects >40 years, history of irregular menstrual cycle, taking contraceptive pills, anti-histaminic, antiepileptic, psychotropic drugs (sedative, Transquilizers, hypnotics), alchohol and smokers were excluded from this study. Subjects having psychiatric disorders, epilepsy, endocrinological disorders, pathology or injury to the upper limb,sleep disorders, hearing disorders, visual disorders and athletes were also excluded from this study.

Participants were instructed to visit the department during follicular (9-12th days) and luteal phase (19-22th days) of menstrual cycle at 10 o'clock in the morning.

After 15 minutes rest, visual reaction time was carried out in a quiet room. The visual reaction time was measured by " Multiple Choice Apparatus 635 MP (Reaction Time Apparatus)", Inco company product (Ambala). The procedure was explained to the participant. As soon as the stimuli (green light) perceived by the participant, she had to be respond by pressing the response key by the index finger of the dominant hand. After given repeated practice, 3 reading were taken. The lowest reading was taken as the value for reaction time. Simple visual reaction time and Choice visual reaction time were taken by this method. The result was analysed by graph Pad Instat Statistical software (demo version) and $p<0.05$ was taken as significant.

Result: Total 50 healthy subjects between the age group 26-40 years were enrolled in this study. Simple and Choice visual reaction time were taken during the follicular and luteal phase of menstrual cycle. Table I compare simple visual reaction time and table II compare choice visual reaction time during follicular and luteal phases.

Table:1 Comparison of Simple visual reaction time during different phases of menstrual cycle

Phases of menstrual cycle	Mean	±SD	T value	P value
Follicular phase	0.233	0.061		
Luteal phase	0.26	0.065	2.11	<0.05

Table:2 : Comparison of Choice visual reaction time during different phases of menstrual cycle

Phases of menstrual cycle	Mean	±SD	T value	P value
Follicular phase	0.37	0.0591		
Luteal phase	0.395	0.059	2.114	< 0.05

Discussion: Reaction time is an important cognitive test and considered as an index of CNS processing. This study compare the sensory-motor cordination in follicular and luteal phase of menstrual cycle. The sex hormones, especially estrogen and progesterone secreted from the ovaries, vary in their level during different phases of menstrual cycle. The menstrual phase is characterized by low levels of both these hormones and as we progress through the follicular phase, estrogen level rises rapidly to reach the peak just before ovulation, with progesterone levels continuing to remain low. Whereas during the luteal phase, the levels of both estrogen and progesterone rises, thus in the mid luteal phase, both the hormones are high. Hence during the normal menstrual cycle, there are two peaks of estrogen secretion, an "ovulation peak," which occurs near the end of the follicular phase and a "luteal peak." Progesterone reaches a peak about 4-7 days before menstruation[6].

Mean simple visual reaction time during follicular phase is 0.233 **±** 0.0616 and during luteal phase is 0.26 **±** 0.0656 (table-I) . The table shows that simple visual reaction time increase during the luteal phase as compared to the follicular phase. This increase in simple visual reaction time during luteal phase is statistically significant ($p< 0.05$).

Mean choice visual reaction time during follicular phase is 0.37 **±** 0.0591 and during luteal phase is 0.395 **±** 0.059 (table-II) . The table shows that choice visual reaction time increase during the luteal phase as compare to the follicular phase. This increase in choice visual reaction time during luteal phase is statistically significant ($p< 0.05$).

Similar findings were reported by Bhakti Dabir et al[7], Sunil Kumar et al[5], and S. Das et al[8]. They studied audiovisual reaction time during different phases of menstrual cycle. Found increase reaction time during luteal phase (premenstrual phase) in comparision to follicular phase (postmenstrual phase) of menstrual cycle. But according to Veena et al[9] study visual reaction time was highest during the mid proliferative phase (follicular phase) and lowest during the premenstrual phase (luteal phase).

According to this study visual reaction time is longer during luteal phase as compare to the follicular phase. This increase in visual reaction time can be due to effect of sex hormones (mainly progesterone) that causes salt and water retention thus affecting the axonal conduction. Altered axonal conduction influences the availability of neurotransmitter at synapses in signal processing

pathway that causes slow conduction of the impulse and hence prolonged reaction time[8] . Another metabolite formed by reduction of progesterone which acts in the brain as an anasthetic / anxiolytic agent by binding to gamma aminobutyric acid (GABA) receptor. GABA is a inhibitory neurotransmitter, an endogenously produced anxiolytic like compound. These metabolites are formed in women during premenstrual phase when progesterone excretion is high. Apparently the confirmation changes of GABA receptor after anxiolytic steroid binding increase the affinity of GABA for this receptor. GABA favours influx of chloride ions into the cells. Increased chloride entry into brain cells serves to hyperpolarize the membrane and thereby inhibits neural transmission. This neural transmission inhibition affects sensorimotor association and processing capability of central nervous system [10].

Limitation of the study:

Phases of menstrual cycle were classified on the basis of history and not on serum level of oestrogen and progesterone.

Conclusion:

We concluded that reaction time is prolong during the luteal phase as compared to the follicular phase of menstrual cycle. This may be due to effect of progesterone on neural transmission.

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