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EFFECT OF PREMENSTRUAL STRESS ON AUDIOVISUAL REACTION TIME AND AUDIOGRAM

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Abstract: A study of weight, auditory reaction time (ART), visual reaction time (VRT) and audiogram was carried out on 105 healthy female subjects between the age of 17-20 years during the premenstrual and post-menstrual phase. A significant increase in weight and prolongation in auditory reaction time (ART) and visual reaction time (VRT) were observed during premenstrual phase. A slight increase in decibel loss was also observed during premenstrual phase in audiogram though not significant. These changes could be attributed to fluid and salt retention due to overain steroids leading to decrease in the processing capability of central nervous system.

Key words : premenstrual stress, auditory reaction time, visual reaction time, audiogram

INTRODUCTION

The premenstrual syndrome is a recurrent, variable clusters of troublesome ill defined symptoms and signs that develop during the 10 days before the onset of menses and subside when menstruation occurs (1). Certain behavioral and neurological symptoms viz headache, malaise, nervous irritability, emotional instability, decreased ability to concentrate, decrease in skin resistance and increased blood pressure have been reported during the premenstrual phase and are associated with salt and water retention (2,3,4,5). There is a lacunae in literature about reaction time and audiometric study in menstrual cycle. Reaction time measurement is an indirect index of processing capability of central nervous system and simple means of determining sensory motor association and performance of a individual (6, 7) and audiometry is psychophysical method of studying sensory function (8). So the aim of the present study was to see, whether the state of premenstrual tension affects the sensory function and/or sensory motor association and processing capability of central nervous system. We have studied the following parameters: weight, auditory reaction time, visual reaction time and audiogram.

METHODS

The present study was carried out on 105 normal healthy female subjects, without any hearing or visual disorder in the age group 17 to 20 years. Their detailed menstrual history was noted and the premenstrual and postmenstrual phases were calculated as follows:

Premenstrual phase - 1 to 7 days prior to onset of next menstruation.

Postmenstrual phase-5th to 10th day of the menstrual cycle. Their weight in kilograms, auditory reaction time (ART), visual reaction

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time (VRT) and audiogram were measured both during premenstrual and postmenstrual phases. ART and VRT were measured by reaction time apparatus supplied by Medicaid System, Chandigarh. This instrument is equipped with very sensitive quartz clock which can measure upto 1/10th of a msec. Accuracy of this instrument is ± one digit. For ART the stimulus used was a continuous beep of 1 KHz on speaker. For VRT a soothing yellow light incorporated on the instrument was given. Before measuring ART and VRT each subject was made familiar with the apparatus. All the subjects were right handers and used their right hand to press the switch immediately after receiving visual and auditory stimulus respectively. Three readings of each stimuli were noted by autodisplay after giving three practical trials and the lowest was taken as the reaction time.

Audiogram was taken both during premenstrual and postmenstrual phases using a screening audiometer supplied by Amplaid (121) Milan, Italy. The unit features 11 frequencies by air conduction, steady or pulse tone presentation and full range attenuation from 10 to 100 dBHL in 5 dB steps. The unit is calibrated to ISO specifications. Cushioned ear phones are provided to avoid external disturbances. The subject was acquainted with the apparatus before recording audiogram. She was instructed about the procedure and given a response button to be pressed when she heard a sound signal at minimum decibels and was marked on audiogram chart. This procedure was carried out at frequencies 250 Hz, 500 Hz, 1 KHz, 2 KHz, 3 KHz, 4 KHz, 6 KHz. The study was conducted in a quiet room, in the Department of Physiology, Lady Hardinge Medical College, New Delhi.

All the data was statistically analysed using the paired 't' test.

RESULTS

Table I shows the mean values of weight, auditory reaction time (ART), and visual reaction time (VRT).

(i) There is a significant increase ($P < .001$) in weight during premenstrual phase.

(ii) Both ART & VRT were significantly increased ($P < .001$) during premenstrual phase.

TABLE I : Data with statistical analysis of weight, ART and VRT (Mean ± SEM).

Parameters	*Premenstrual (n = 105)*	*Postmenstrual (n = 105)*	*'P' value*
Weight (kg)	50.99 ± 0.55	50.33 ± 0.55	< .001
ART (msecs)	233.06 ± 8.73	182.09 ± 7.37	< .001
VRT (msecs)	241.95 ± 14.08	197.05 ± 9.16	< .001

Table II shows the mean hearing levels (dB) at which the subject was able to hear the sound at various frequencies by each ear. No statistical difference was found in hearing in the premenstrual phase as compared to post menstrual phase, although the values were slightly higher during premenstrual phase.

TABLE II : Hearing levels (dB) during premenstrual and postmenstrual phase (Mean ± SEM).

Frequencies	*Right Ear (n = 30)*		*Left Ear (n = 30)*	
	Premenstrual	*Postmenstrual*	*Premenstrual*	*Postmenstrual*
250 Hz	35.66 ± 1.22	30.40 ± 1.74	34.50 ± 1.20	34.33 ± 1.19
500 Hz	22.83 ± 1.54	21.50 ± 1.49	21.66 ± 1.20	21.60 ± 1.02
1 KHz	20.16 ± 0.94	17.16 ± 1.22	19.83 ± 1.03	19.16 ± 1.10
1.5 KHz	17.00 ± 0.98	13.83 ± 1.01	15.56 ± 1.36	15.33 ± 1.36
2 KHz	9.86 ± 1.02	9.00 ± 1.16	11.16 ± 1.01	12.09 ± 1.35
3 KHz	10.83 ± 1.10	9.16 ± 0.98	12.66 ± 1.28	11.40 ± 1.27
4 KHz	9.09 ± 1.30	9.33 ± 0.98	10.16 ± 1.16	10.51 ± 1.17
6 KHz	14.51 ± 1.50	12.33 ± 1.39	15.90 ± 1.40	16.83 ± 1.53

P values - Premenstrual vs postmenstrual are > 0.05 (not significant).

DISCUSSION

In the present study a significant increase in weight gain was observed during premenstrual phase. The literature is replete with reports of patients suffering from severe premenstrual fluid accumulation sometimes even up to 10 lbs in weight gain (2,3,4,9). The degree of premenstrual weight gain is reported to correlate with degree of various premenstrual neurological symptomatology in many cases (2,3,4,9,10) leading to poor attention and performance. This may be the cause of prolongation of both auditory and visual reaction times in the present study, since reaction time indicates the minimum time taken by an individual to react to an external stimulus (11), and is an indirect index of processing capability of central nervous system and sensory motor association (6,7).

Studies on audiogram show no significant deterioration in hearing during the premenstrual phase when compared to postmenstrual period. Furthermore, the increased values obtained at 500HZ, 1 KHz, 2KHz during premenstrual phase are less than 25 dB which is within normal hearing range (12) denoting no sensory deficit of auditory pathways. Similar observation have been noted by Fagan and Church (13) who did not find a cyclic variation in the brain-stem auditory evoked potentials during menstrual cycle, whereas Bhatia et al (14) observed a higher threshold for evoking V wave of BAEP and higher absolute peak latencies of waves with decrease in amplitude of wave V during premenstrual phase and suggested delayed conduction time of auditory impulses from auditory nerve to mid brain. Bruce and Russel (15) suggested that retention of water and sodium due to variation in sex steroid levels during menstrual cycles might influence the process of axonal conduction time and availability of neurotransmitter at synapses in the auditory pathways ; changes in either of these two processes might cause conduction time to vary during menstrual cycle, whereas Broverman et al (16) suggested that hearing sensitivity may be affected by estrogen secretion through its influence on acetylcholine which has been shown to be the neurotransmitter in auditory system.

Our finding that reaction time is significantly prolonged during the premenstrual phase could be attributed to the modulation in neurotransmitters involved due to hormonal fluctuations hence affecting sensory motor association and processing capability of central nervous system. It can be taken into consideration in neurological and behavioural assessment of women and also in designing the research protocols.

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